

Book Review Section

Compiled by John Jenkin*

Alfred W. Crosby, *Ecological Imperialism: The Biological Expansion of Europe, 900-1900* (Cambridge Univ. Press, 1986), 368 pp., illus. (\$19.95).

This is a landmark volume deserving attention from historians of science as well as of European expansion, practitioners of all the biological sciences, environmentalists, and the public at large. Readable, concise, powerfully argued and well illustrated, this book should appeal with equal force to the layman, the undergraduate and the mature scholar. Discerning treatment of a fascinating and important topic makes for compelling reading in any field, and Crosby handles his subject with commendable authority. Sufficient statistics to support his case are skilfully woven into a narrative which never falters. Crosby's study represents nothing less than an historiographical milestone in the development of Western man's sense of ecological awareness and environmental responsibility. In examining the biological consequences of European expansion on a global scale, he explicates the links that inextricably bind the physical world to its floral, faunal and human inhabitants.

Ecological Imperialism is enormously exciting because it is inter-disciplinary in the best sense. It reminds us that such studies can not only throw new light on old problems, but that they can link traditionally distinct fields of research in a manner exemplary of the unity of human experience and productive of fertile new departures for further inquiry. Crosby's book is very much one whose time has come. This, the third offering in the Cambridge Press's very promising 'Studies in Environment and History' series, is the natural outgrowth of the author's previous work on the historical consequences of specific intercontinental exchanges of plants and pathogens. Crosby succeeds in drawing together themes that scholars from fields as diverse as geography, biology, anthropology, archaeology, intellectual history, imperial history and development studies have been wrestling with for some years in an attempt to come to grips with the central issue of analyzing man's role in changing the natural environment. (One is reminded here especially of Keith Thomas' 1983 study of the transformation of modern sensibility in *Man and the Natural World*).

It may not be too much to hope that Crosby's pioneering study of environmental history can perform for the various subdisciplines of history a service akin to that which evolutionary theory did for the biological sciences or the concept of plate tectonics did for the earth sciences. Even if it does not succeed in shifting the

paradigm from its traditional anthropocentric focus, Crosby's book will certainly compel historians to begin more serious consideration of the interplay between human and environmental factors in shaping the modern world. We must now take into our accounting, man as an agent of active and accidental environmental change, as a powerful determining factor in the fate of other life forms and ecological processes upon whose survival or extinction, maintenance or degradation, the success or failure of human activities reciprocally depends.

Such self-awareness is painful enough to achieve, as Crosby demonstrates. The record of European expansion reads all too often like a tale of plunder and murder. The feats of greed and rapine, which only a generation or so ago still formed the backbone of the national myths of the European imperial powers and their colonial offshoots, were buttressed by religious and later scientific ideologies asserting the superiority of man over nature, of northern over southern species and of Caucasians over other races. All this we know. But Crosby performs the signal service of directly linking the European attitude of dominance over nature and other races to the protracted process of commercial expansion, imperial conquest, colonial foundation, mass emigration and technological deployment, whereby Europeans reshaped most of the habitable globe in the image of Europe. In this process they created a world-wide economy based on systematic exploitation of the natural resources and human labour indigenous to the peripheral regions being forcibly integrated into the European industrial and commercial nexus.

Crosby draws a continuum from the ninth-century Viking voyages across the North Atlantic through the Crusades of the later Middle Ages to the great wave of modern European imperialism, which began with the Portuguese voyages of discovery in the fifteenth century and culminated in the great powers' scramble for overseas annexations in the last quarter of the nineteenth century. As he emphasizes, it was the Portuguese development of transoceanic navigational capabilities that made possible both the acquisition and the maintenance of colonial empires, and the transformation of these newly discovered islands and continents by means of imperialism's biological agents. These pathogens, plants and animals, whether introduced by design or adventurism, aided the invaders by drastically culling or entirely exterminating native species and races rendered less hardy than their new competitors by long isolation. With the way thus cleared, intruding Europeans were able to establish their 'Neo-Europes' with relative ease, monopolizing the world's most productive agricultural regions and thereby establishing a Caucasian preponderance in human affairs that can be measured in terms of political and economic power as well as sheer demographics. The goat and the sheep, the clover and the dandelion, along with the smallpox and influenza viruses – the 'portmanteau biota', as Crosby terms it – must now take rank with the man-of-war, the repeating rifle and the Bible as instruments of European imperialism.

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Crosby rightly stresses that the Portuguese and Spanish conquests of the Azores, the Madeiras and the Canary Islands in the eastern North Atlantic were the prototypes for all the transoceanic colonies that would follow. In these laboratories of imperialist technique were learned the lessons of occupying new lands, defeating or exterminating recalcitrant indigenes who resisted conquest, removing native vegetation on a drastic scale, importing new crops and livestock compatible with metropolitan markets and, finally, introducing non-native peoples as a labour force to grow these products. In all the lands that were to follow this general pattern, native ecosystems were disassembled by the Europeans and rebuilt using imported parts considered more congruent with European needs. The process was often haphazard and frequently unintentional, occurring, like the introduction of 'weeds' and 'vermin' — those ubiquitous fellow-travellers of the imperialists — as a byproduct of European attempts to come to terms with alien environments. Nor can it be condemned in all its aspects with the wisdom of Whiggish hindsight, for many of the ecological enormities we deplore in our forebears were undertaken in the sincere desire to 'improve' unfamiliar lands that seemed forbidding or useless in their natural state. We must also remember that it is only recently that wilderness has become valuable as a result of its scarcity. The development of the threats of massive pollution and nuclear holocaust has engendered the realization among Europeans and Neo-Europeans that in the preservation of the full range of wild terrestrial ecosystems resides our hopes to maintain genetic diversity, retain man's natural identity and achieve our quest to discover the history of life.

The economic and political integration of the world's various regions and cultures at some level was inevitable once the technical problems of long-distance communication and transportation were overcome by some society. Given the technological lead established by Europe and the dynamism of its economy and culture, the historical phenomenon of imperialism was certainly a plausible option. But the European attitude of dominance towards nature and other races was not an inevitability: Europe's rough wooing of other lands and peoples need not have been so brutal as it too frequently proved in practice. Yet as Lewis Mumford presciently observed over forty years ago, 'the same underlying animus prompted the explorer and the scientist, the pioneer and the inventor'. Progressive scientific exploration of the structure and dynamics of the physical universe, like geographical discovery and colonization of the lesser-known parts of the globe, fostered 'an immense expansion of human powers' and represented a potent 'agent of release' to Europeans intoxicated with the possibilities of environmental manipulation on the grand scale opened up by the Promethean power of industrialization (*The Condition of Man*, 1944, pp. 249, 252). So close has remained the identification of Europe's descendants with the heedless *conquistador* mentality of the past that, ironically, it is only after we have begun to concede the equality of our fellow men and women that we have been forced to recognise that nature herself is no longer the common enemy.

Ecological Imperialism is particularly relevant to Antipodean readers because many of its examples are drawn from the relatively well documented history of the destruction of native peoples, plants and animals in Australia and their replacement by European counterparts during the colonial period. This is, of course, *The Fatal Impact* of which Alan Moorehead has eloquently written. Fifty pages — one sixth of Crosby's volume — are also devoted to a detailed analysis of this ecological dimension of the European takeover in New Zealand. The historian of science could wish for more information on specific topics such as the manner in which metropolitan and colonial initiatives for the use of various sciences as tools of economic development and cultural domination were articulated in various imperial systems, or the mechanisms that evolved for co-ordinating public and private efforts. Crosby might also have included discussion of the activities of the acclimatization societies that were established to promote the introduction of new species into supposedly barren colonial environments. But this is a general book, and that is its strength. It is a pathfinding work that points out the need for further in-depth studies of the inter-relationships between science, technology, empirical experimentation and even sheer accident in facilitating the imposition of European dominance upon the world. It is imperative that we understand the practical consequences of this fusion between knowledge, praxis and political power if we are to accomplish the requisite transformation in our outlook towards nature.

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N. Reingold and M. Rothenberg (Eds.),
Scientific Colonialism: a Cross-cultural
Comparison (Smithsonian Institution Press,
Washington D.C., 1987), 398 pp. (\$74.50).

'Colonial', to someone growing up in London in the 1940s and '50s, had to do with governing Indians and Africans allegedly for their own good but probably against their will; it stood for a curious mix of high-mindedness and power-politics. To apply it to Australia seemed a joke like talking about 'going native'; and yet all jokes have to be near the bone if they are to work at all. By the 1980s, anyone living in the north-east of England is bound to feel a bit like a colonial: heavy industries are first nationalised and then shut down by secretive spycatching governments in London on which our destiny seems to depend. Colonial has become an imprecise term. What one can say is that in the twentieth century it is a negative term, something nobody could be in favour of, whereas a hundred years ago this was not the case.

Scientific Colonialism is a series of papers from a conference in Melbourne in 1981. The chief comparisons are between Australia and nineteenth-century

USA, but there are also a few other examples. The book, which has been a long time in gestation, thus falls conveniently between the two Bicentennials. What it makes clear is what different kinds of anniversaries these are. There is nothing about the American colonies; the American material is concerned with science in an independent nation which occupied an important place in any ranking of nations. So any colonialism here has no connections with government from overseas; but it is to do with patronage, with deference, and with feeling oneself on the fringes of civilisation. Where a theoretical model is at the back of contributors' minds, it is one of three stages: from the non-scientific society, through the colonial, and on to the independent phase. This was proposed by George Basalla in 1967, some way behind Macmillan's 'wind of change' vision of colonialism in Africa.

When contributors try to apply such a model, they find how hard it is to do. The idea is so very general that it seems almost analytically true; and yet there are so many differences between Ireland, Quebec, Mexico, Australia, New Zealand and the USA (all mentioned in this book) that the model is unhelpful. It lacks any of the testability which one looks for in a scientific theory; and while Roy MacLeod and Wade Chambers have many interesting and stimulating things to say about science done in remote places, one is left with the feeling of how particular history is. Personalities, institutions, booms and slumps at particular times and places, and even fashion are so important (and so interesting) that no model can supply more than a kind of scaffolding useful in erecting an historical edifice. History has to be based upon general assumptions, almost axioms, if it is to be more than a chronicle; but whether the 'colonial' one is very useful is still uncertain.

In 1981 came the 150th anniversary of the British Association for the Advancement of Science, and Jack Morrell and Arnold Thackray's book about its early years, *Gentlemen of Science* (Oxford, 1981). This concentrated upon relations between the provinces, where the association met each year in a different city, and London, and on social status. As Cambridge men took increasing control of the BAAS, with their gentlemanly vision of how science should be carried on, so the provincials had to fall into place as an audience and provider of festivities, and otherwise as the corporals and privates of the scientific army. Provincials were men under authority, providing data upon which their betters could reason. This pattern probably applied most easily in natural history and in astronomy, where keenness could be channelled into useful observations.

This picture of gentlemanly science at this period has been reinforced by Martin Rudwick's book, *The Great Devonian Controversy* (Chicago, 1985), in which he looks more microscopically at the geological community at the same time, seeing how controversy was resolved, how outsiders might achieve entry into the central group, with its high status, or might forever be kept at a distance, in their place. The tyranny of distance applied even here, for those in Devonshire were far from the centre and found their work being used and interpreted

by others, who sometimes gave them patronage but were sometimes just patronising. These studies and other recent work on British science in the nineteenth century, the age of science and of specialism, show how many Britons could feel just as excluded as any Australians or Americans; though with the penny post and the railway system the distances that came to matter were social rather than geographical.

Just as the chemist and philanthropist William Allen could advocate setting up colonies at home, provincial men of science found themselves put in the colonial position of primary producers of facts, which would be manufactured into theory by those far from them. And they might find, like Rutherford, that there was no outlet for their talents at home. Davy came from Cornwall to London, Thomas Graham from Scotland and John Tyndall from Ireland, and could not really contemplate returning to their birthplace for more than a visit. The provinces might even be the focus of an expedition from London, as when Airy, the Astronomer Royal, came to Harton Colliery near Newcastle for gravitational studies. And plants and fossils found in the provinces were likely to be whisked off to London museums or to Kew Gardens, like those from the colonies.

There were those two hundred years ago who hoped that the USA, home of the most vigorous and energetic Britons now free from King and established Church, would soon become a cultural and scientific leader. It took a long time, and historians of nineteenth-century America used (like some nineteenth-century scientists) to groan at how provincial it all was. Nathan Reingold was one of the first to argue that it was different rather than inferior; that naturally in a new country, the 'Humboldtian' programme of natural history, geography and geophysics would be followed rather than something based upon theoretical physics or chemistry. The odd Dalton or Willard Gibbs would appear in provincial or 'colonial' science, but the emphasis would be on usefulness and empiricism and not on mathematical elegance or gentility and liberality. Here, Reingold has an interesting paper on graduate schools, comparing the USA with Germany, to whose chemistry the British found themselves in a 'colonial' position about a century ago.

A scientific community grew up in the USA through graduate schools and medical institutions, as sketched out here by Ronald Numbers and John Warner; and American engineering developed its own style in a manner which Edwin Layton describes. Sally Gregory Kohlstedt writes about American museums, and Susan Sheets-Pyenson about colonial ones. Australia, where the different colonies sometimes had more connections with London than with each other and where population and diversity had more growing to do, could only, as Rod Home shows, develop a physics community later, and lost Bragg down the brain-drain to Britain. Ann Moyal, who has recently written a survey of the history of Australian science, *'A Bright and Savage Land'* (Sydney, 1986), writes about telegraphy in Australia, and Kathleen Dugan about zoological exploration and, in particular, about the reproductive system of the

monotremes. Europeans could not believe that even in the Antipodes there might be egg-laying mammals, and knew a tall story when they heard one. Their eventual acceptance of platypus eggs makes a good case study of the theory-loading of observation, in this case compounded by metropolitan-colonial factors. From C.B. Schedvin we learn about the utilitarian emphases in Australian biology down to 1939; and D.J. Mulvaney gives us a rather whiggish account of early anthropology in Australia. From Lewis Pyenson we get a curious story of the effects of World War I on geophysics in Samoa, and from Lawrence Badash an account of Rutherford's New Zealand background.

The book is uneven; no doubt the papers led to useful and lively discussion, and they are interesting for anybody concerned with the transfer of science from European capitals to the wider world. Whether we get much more than a series of interesting case studies is open to doubt; but anybody working particularly on Australian or American science will find here stimulating ideas. It is a great pity that in a book of this title there is nothing about India, that laboratory in which British administrators could perform experiments and where some tasks were open to indigenes. But the editors are to be congratulated on bringing out a thought-provoking collection, even if at the end of it one is still uncertain how far 'colonial' is a state of mind, and how far any patterns of development are repeated.

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B.G. Cooper and C.G. Gatehouse (Eds.),
Earth Sciences History, vol. 5, no. 1 – Special Australasian Issue (History of Earth Sciences Society, New York, 1986), 103 pp., illus. (A\$15.00).

This special issue of the American-based journal is a collection of papers dealing with earth science history in Australia and New Zealand. It results from an invitation to contribute made to founding members of the Earth Sciences History Group, begun in 1984 as a specialist body of the Geological Society of Australia. Of the seven papers in the volume, six are devoted to the development of earth science in Australia and one to science in New Zealand.

Three of the Australian papers are concerned with palaeontology, a proportion perhaps not surprising in view of the nineteenth-century preoccupation with fossils, both as determinants of the order in time of sedimentary rocks and as part of the raw material of contemporary debates about evolutionary theory. The papers on this theme differ widely in their scope and style of presentation; only one, N.W. Archbold's

account of nineteenth-century views on the age of Australian marine rocks now known to be Permian, focuses on a specific problem. The others, 'The Early History of Palaeontology in Western Australia, 1871-1899' by Kenneth McNamara and Frances Dodds, and Susan Turner's history of vertebrate palaeontology in Queensland, are chronological accounts of the development of the discipline on a regional basis.

Archbold's article records separately the observations made on eastern and western Australian marine fossils during the nineteenth century. This is a logical subdivision because of the differences in fossil biotas between east and west, with those from the eastern part of the continent having a higher proportion of endemic species and so presenting most problems to early palaeontologists because of their greater dissimilarity to the European faunas which inevitably provided the standard for comparison. The account is appropriately set against the backdrop of the development in Europe of the Permian System which, although defined by R.I. Murchison in 1841, took over a century to reach its present format of geological stages. Archbold identifies four phases of observation: an initial or 'classical' phase from 1818 to 1837, which produced only brief comment on collections returned to England; a 'foundation' phase, to 1849, with more detailed descriptions of fossils and strata; a 'stratigraphical' phase to 1871, characterised by little description but much debate over ages and stratigraphical relationships, including the oft-reported controversy between W.B. Clarke and Frederick McCoy on the age of the coal measures; and finally, a phase of resurgence in description, extending to the twentieth century and encompassing Robert Etheridge Jnr's heroic descriptive efforts.

McNamara and Dodds' paper on the early history of palaeontology in Western Australia recognises three chronological intervals. There was a phase of early discoveries to 1841, a second phase in which discovery of fossil deposits accelerated as a result of exploring expeditions to the north and interior, and a third, from 1859 to 1900, distinguished by the intensified description of fossil faunas. Two aspects of this narrative stand out; the first is the sheer volume of comment generated in the earliest stages of exploration and settlement by structures that are not fossils in the strict sense at all, but stem-like or ramifying bodies associated with carbonate solution and redeposition in the 'limestone' or calcarenite formation of ancient dune sands that borders the coastline in the southwest. The second revelation is that it was not until the beginning of the twentieth century that any taxonomic work on fossils was carried out within Western Australia. This reflects the relatively late appearance there of that stage in the development of colonial science when local specialists and local institutions begin to take responsibility for interpretation.

In an exceptionally well written article, Turner describes how the opening up of the Darling Downs to European settlement resulted in the discovery of giant bones in creek beds and well shafts, how these bones were sent by settlers to the embryo Australian Museum in Sydney and from there, or directly, on to England to

'the hub of the world of vertebrate palaeontology in the Empire, Richard Owen'. The narrative of the bone collectors, most of them correspondents of Owen, is a kaleidoscope of colonial science. Included are the surveyor Thomas Mitchell and the explorer Leichhardt, who in a letter to Owen confided his belief that the animals represented by the bones might still be living in the tropical interior that he hoped to cross. There are accounts by George Bennett, naturalist and curator of the Australian Museum, by Samuel Stutchbury, first qualified geologist to work in Queensland, by the Rev. W.B. Clarke, and by 'Darwin's bulldog', T.H. Huxley. In the post-Owen era, Turner focuses on the development of an indigenous 'centre of excellence' in vertebrate palaeontology at the Queensland Museum, the curators and directors of which included Charles Walter de Vis (1882-1905), Heber Albert Longman (1917-1945), and J.T. Woods, who maintained the work of collecting, describing and popularising vertebrate fossils, often through periods of considerable economic hardship. They, and others, contributed to building a reputation for indigenous Australian research within the world scientific community.

Away from the field of palaeontology, T.G. Vallance's article on Alfred Howitt records an outstanding example of innovation in a colonial setting. Howitt, a police magistrate and largely self-taught in geology, produced, through the years 1875 to 1892, a series of papers based on sequences in the eastern highlands of Victoria, documenting progressions in metamorphic intensity from folded sediments through to crystalline schists and gneisses. His observations anticipated the work of George Barrow, who in 1893 published his classic story of metamorphism in Forfarshire, Scotland, finding there that mappable zones could be identified by the first appearance of index minerals signifying progressive changes in the intensity of metamorphism. Vallance sets Howitt's achievement securely into an international context, presenting a picture of contemporary geological thought, with its opposing influences of Lyell and Werner on the nature of crystalline rocks, and noting Geikie's remark that as late as the 1880s, the 'pendulum of geological opinion' still vibrated between the two doctrines, although advocates of metamorphism were then gaining ground.

There is irony in the fact that Howitt's metamorphism 'remained practically a preserve of Victoria until the 1940s', and that it was only after George Barrow's ideas on metamorphism had been transferred to New South Wales that the magnitude of Howitt's achievement, and the nature of the distinctive style of metamorphism that he had struggled to interpret, became apparent.

In terms of sheer entertainment, Reg Sprigg's article, 'The Adelaide Geosyncline: a century of controversy' is the best value in the volume. In what he refers to in his acknowledgements as 'a personally biased history', Sprigg provides a lively ramble through the hall of fame of South Australian geology, where the characters are only loosely linked by their association with the sediments of the geosyncline. The narrative is written in a curious mix of first and third person, and is enlivened

by anecdotes of his personal encounters with many of the *dramatis personae*. In his section on 'geological men of the cloth' can be found accounts of the South Australian connections of the Reverends Tennison Woods, W.B. Clarke, and Walter Howchin, and of T.W. Edgeworth David as lay preacher, encouraging Adelaide clerics to quarry quartzites to help in his search for fossils. The size of the cast of eminences in this paper probably reflects the diversity of the rocks themselves and the interest generated by the spectacular nature of the sequences, incorporating as they do some of the best known examples of Precambrian glacials and the most famous of very early life forms. There is an account of Mawson, fresh from his Antarctic experiences, embarking on detailed interpretation of the ancient glacial rocks in the Flinders Ranges, and of his conflict with his former Antarctic colleague, C.T. Madigan, who, Sprigg alleges, was critical of Mawson's ability to interpret structure in three dimensions. The reading of the article would, I felt, have been made easier for those unfamiliar with local detail had there been included a simplified diagram showing the stratigraphic relationship of rock units.

The last article to deal with the development of Australian geological thinking is H.E. Le Grand's study of the reception of the idea of continental drift in this country in the years 1920 to 1940. Le Grand presents the view that theories of drift evoked little interest in Australia in this interval; there was here none of the polarization of viewpoints, or the intensity of debate, that the concept of mobile continents generated elsewhere. This lacklustre reception of the idea Le Grand attributes to pre-occupations with local geology, including much that was economic in orientation, and for which drift theory appeared to have little relevance. (Contrast the present acceptance of plate tectonic theory, in which the most local of phenomena are interpreted, often doubtfully, in terms of global events).

The Australian geological ethos was, in the interval considered, largely atheoretical; for source data on this point Le Grand makes reference to the content of examination papers in geology in the 1920s and 1930s, as well as to more conventional sources, and finds that an empirical and descriptive approach predominated. He notes a few geologists of the time who were positively inclined toward drift theory; Edgeworth David and L.A. Cotton for instance, and Arthur Wade, who was the first official advisor to the Commonwealth Government on matters related to oil exploration. Le Grand uses the findings of his survey of attitudes to challenge current models of the sociology of scientific change, which are premised on the assumption that most scientists, when faced with competing theories, make a choice between them; not so, it seems, in the Australia of the 1920s and 1930s.

The single paper in the collection that deals with New Zealand is C.A. Fleming's 'The contribution of New Zealand geoscientists to the development of scientific institutions'. In a series of brief, usually informative vignettes, it refers to the early influences of visiting Europeans such as Ferdinand Hochstetter, and

of resident scientists, formally trained or otherwise, such as Walter Mantell, Julius von Haast, and W. Lauder Lindsay, whose influences extended beyond the earth sciences. The influence of Lauder Lindsay was exercised through the publication of lectures in pamphlet form, including his 'Place and power of Natural History in colonization ...'. Fleming records that so many of Lindsay's ideas, such as his recommendation for a university in Dunedin with joint appointment of staff between academia and government, were implemented, that it seems such pamphlets were widely read. I felt here a need for some elaboration of just how such prophecies came to be fulfilled; it all seemed just a little too easy. There is documentation, too, of the beginning (in 1864) and subsequent growth of the New Zealand Geological Survey under the particular influence of James Hector, whose administrative control of scientific institutions later extended to include a range of museums, libraries and observatories.

There can be little doubt that this volume will be an important reference for students of Australian science. There is a wealth of detail, and the bibliographies appended to each chapter are themselves a valuable data source. It may be that an international readership, for which it is presumably intended, would have benefited from a more extensive introduction from the editors and the provision of some generalities about the development of science in the particular setting of colonial Australia. A minor irritation in the volume is that no sources are given for many of the photographs included, particularly for the portraits of historical figures.

In their preface the editors report that response to their initial call for papers was so enthusiastic that some articles have been held over for a subsequent issue. A second volume as valuable as this one is anticipated with pleasure.

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John Jenkin, *The Bragg Family in Adelaide: A Pictorial Celebration* (Univ. of Adelaide Foundation and La Trobe Univ., 1986), 86 pp., illus. (\$15.00).

The world make such heroes – demi-gods, almost – of its famous scientists, that one needs at times to be reassured of their common humanity by encountering them in their ordinary lives, pursuing pleasant pastimes between the brilliant discoveries, prey to familiar failings, seized by everyday hopes and fears, surrounded by children and pets. So we find William Henry Bragg (1862-1942) and his son, William Lawrence Bragg (1890-1971), physicists of renown, in John Jenkin's pictorial study – a charming little book, published to mark the centenary of Bragg senior's arrival in South

Australia and celebrating the long and fruitful association of the Bragg family with Adelaide and its first university.

With over 50 illustrations – including portraits, family groups, local scenes, laboratory apparatus, teams academic and athletic, documents, and more – Dr Jenkin has created a collection with somewhat the air of an informal family album, yet which blends intimacy and elegance in an arrangement most inviting to the eye. Opposite each plate, a brief essay establishes the context to which it belongs, the author deftly weaving together the public and private lives, the professional and the personal careers of his subjects, in a narrative at once sensitive and straightforward.

The story begins with W.H. Bragg's rather solitary childhood in Market Harborough, Leicestershire, and with his education – first there, later at King William's College on the Isle of Man. Thence we follow him to Cambridge, to triumphs in mathematics and a firm grounding (despite Bragg's own disclaimer) in physics; and in no time at all to Adelaide, where – at the age of 23 – he was to take up the chair of mathematics, with responsibility also for physics, at a university scarcely half as old as himself. Here, in a small colonial city, Bragg's young life branched and bloomed in all directions – Jenkin's tale following suit – as the shy new professor took up his duties and was himself taken up by Adelaide society. Bragg's teaching programme was heavy and conducted virtually without assistance at first, in primitive conditions scarcely conducive to research. But social refreshment was plentiful, in the shape of amateur theatricals, picnics and tennis, lacrosse matches with the North Adelaide Club that he himself founded, and the company of new friends – foremost among these the family of Charles Todd, of Overland Telegraph fame, and in particular Todd's third daughter, Gwendoline, a delightful young girl whom Bragg would later marry.

Over the next two decades, Bragg was extraordinarily active in Adelaide life and in University affairs: with his wife, an able artist, member of the Society of Arts; prominent in the establishment of the Elder Conservatorium of Music; staunch supporter of the School of Mines; likewise of the Adelaide Golf Club; pillar of the University Council; and sympathetic patron of its students' new Union and Sports Association. As Jenkin explores each of these interests, he affords us fascinating glimpses of Adelaide itself in earlier days, through the history of some of its finest buildings and institutions and through special occasions such as the Duke of York's visit in 1901, with its lavish celebrations.

Interspersed throughout the book, such activities serve as foil to W.H. Bragg's rising career as a physicist. Here Adelaide's role was less beneficent, insofar as it isolated him from fellow researchers in Sydney and Melbourne, while all of them were as remote as possible from Europe. Yet it may be that such isolation itself constituted a stimulus of sorts: the challenge of an obstacle to be overcome, once he had tasted – at the first AAAS meeting, at Sydney in 1888 – the joys of 'contact with other and more experienced

workers' (p.69). And the undaunting atmosphere of colonial science might have reassured one so diffident of his own powers; for one of Bragg's most endearing characteristics was his unfeigned modesty. Jenkin traces carefully his increasing involvement in research, from experiments with X-rays, radio and electromagnetism, to the findings on alpha-particles, and ultimately to the joint discoveries in crystallography which won father and son the Nobel Prize in 1915.

Here, with the glory of such recognition sadly eclipsed by family grief over a younger son's death at Gallipoli, Jenkin leaves the Braggs – they in turn having left Adelaide in 1908. But before this, he has sketched in appealing style the childhood of William Lawrence Bragg, his almost too precocious success at the University of Adelaide, and his quite enchanting discovery of a tiny cuttlefish bone, *Sepia braggi*. Jenkin speculates rather surprisingly – in the face of amusing evidence to the contrary (pp.24-25) – that Bragg senior was 'somewhat distant and aloof' as a father. However, he is on surer ground with the later relationship between the two, WLB having grown up very much in WHB's shadow as well as in his image, one reward for his own brilliant effort at Cambridge being the frequent mis-attribution of 'Bragg's Law' to his father.

There are one or two trifling infelicities in the text – as when the author needlessly tinkers with the elegant 19th century syntax of Horace Lamb (p.61). But that same text is highly readable, replete with engaging detail on all manner of things, and clear enough in its more 'scientific' passages even for this 'unscientific' reader to follow. The book is well-documented, too, and has some quite outstanding photographs in a generally impressive collection. In all, it makes a most fitting and attractive memorial for the life of the Bragg family in Adelaide.

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J. Laurent and M. Campbell,

The Eye of Reason: Charles Darwin in Australasia (Univ. of Wollongong Press, 1987), 88 pp., illus. (\$9.95).

Charles Darwin was 'naturalist without pay' on HMS *Beagle*, with Captain Robert FitzRoy, on its celebrated voyage around the world from 1831 to 1836. The *Beagle* arrived at the Bay of Islands on 21 December 1835, and then visited Sydney, Hobart, King George's Sound and the Cocos (or Keeling) Islands, where it departed from Australasia on 12 April 1836.

This booklet publishes an interesting collection of illustrations (in monochrome), which forms a useful supplement to Darwin's own accounts of his experiences in Australasia, given in his letters, in his *Beagle* diary (first published 1933) and in his *Journal of Researches* (first published 1839). Two particularly fine illustrations

show the plaque at Bathurst which gracefully commemorates Darwin's visit there, and the letter that he wrote at Bathurst on 21 January 1836 to Philip Parker King. The text provides brief extracts from Darwin's accounts, plus some additional material relating to Darwin's period in Australasia.

However, this text can be used only with caution. There are an excessive number of misprints, some of which are rather confusing, eg. 'collected' for 'connected' on page 33. Several dates are given incorrectly, including the dates of Darwin's arrivals at the Bay of Islands, Walerawang and Hobart, and of the third voyage of the *Beagle* (pages 13,18,41,51,52 & 17). Also:

Page 10: Linnaeus's Latin binomial system of biological classification is said to be used 'throughout all countries of the western (*sic!*) world'.

Page 12: Henslow is said to have given Lyell's *Principles of Geology* to Darwin when he left on his voyage, but it was FitzRoy who presented Volume 1 (1830) to Darwin.

Page 13: Darwin is said to have 'experienced an earthquake at Concepcion', but Darwin experienced at Valdivia that earthquake which also destroyed Concepcion.

Page 18: New Zealand is said to have been 'administered from Sydney' when Darwin visited, but there was then no government in New Zealand above tribal level.

Page 29: The artist Conrad Martens, who joined the *Beagle* at Montevideo in 1833, is said to have 'stayed on board until Tahiti' (in November 1835), whereas he left at Valparaiso in 1834.

Pages 43 & 70: Captain FitzRoy did not contribute to *The Zoology of the Voyage of HMS Beagle*, which was edited by Darwin and published in 19 parts from 1838 to 1843 (not in 1840, as stated in the References on page 88).

Page 68: Syms Covington is described as 'an able seaman on the *Beagle*, and Darwin's assistant on some previous excursions during the voyage'. Rather, he began the voyage as 'fiddler & boy to Poop cabin', and from July 1833 he was 'Mr. Darwin's servant'.

Page 74: The Cocos Islands were not the source of Darwin's theory of formation of coral reefs, since he had formulated that theory before he left South America in 1835.

Pages 87 and 88: Several of the references are incorrect.

Some significant events of Darwin's visit to Australasia are not mentioned in this book. The authors do not mention that, at Paihia on Christmas Day 1835, Darwin spent much of the day (between divine services) in conversation with William Colenso, the missionary printer. Colenso was thereby inspired to undertake the study of botany, which led to his Fellowship of the Royal Society in 1883. Thomas Livingstone Mitchell is not mentioned, even though he loaned to Darwin the tektite which Darwin made famous, and Darwin thanked Mitchell (in a footnote in the *Journal of Researches*) 'for several interesting personal communications, on the subject of these great valleys of New South Wales'. The

authors tell (page 85) that Captain John Clunies Ross, founder of the Cocos Islands dynasty, was at Singapore during Darwin's visit to the Cocos Islands, and that Ross published a two-volume treatise on the work of Malthus. But they do not mention Ross' virulent diatribe against Darwin, which was published a year after Ross died in 1854 and set forth by Charles Darwin in his book entitled *Researches in Geology and Natural History*. That appears to have been the first publication of rabid anti-Darwinism, which otherwise got under way after the publication of *On the Origin of Species* in 1859.

The authors do quote (page 13) the final sentence of Darwin's journal for 30 December 1835, but any account of Darwin in Australasia surely should give the full texts of his farewells to New Zealand and to Australia:

'December 30th. – In the afternoon we stood out of the Bay of Islands, on our course to Sydney. I believe we were all glad to leave New Zealand. It is not a

pleasant place. Amongst the natives there is absent that charming simplicity which is found at Tahiti; and the greater part of the English are the very refuse of society. Neither is the country itself attractive. I look back but to one bright spot, and that is Waimate, with its Christian inhabitants'.

'After several tedious delays from clouded weather, on the 14th of March, we gladly stood out of King George's Sound on our course to Keeling Island. Farewell, Australia! You are a rising child, and doubtless some day will reign a great princess in the South; but you are too great and ambitious for affection, yet not great enough for respect. I leave your shores without sorrow or regret'.

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